OPERATING MANUAL

FIREBERD 2000 AND 2000-1
REMOTE CONTROL MANUAL

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ML10491
Rev. B

FIREBERD 2000 AND 2000-1
REMOTE CONTROL MANUAL

For
RS-232 Remote Control (Option 007)
And
IEEE-488 And RS-232 Remote Control (Option 008)

April 1985

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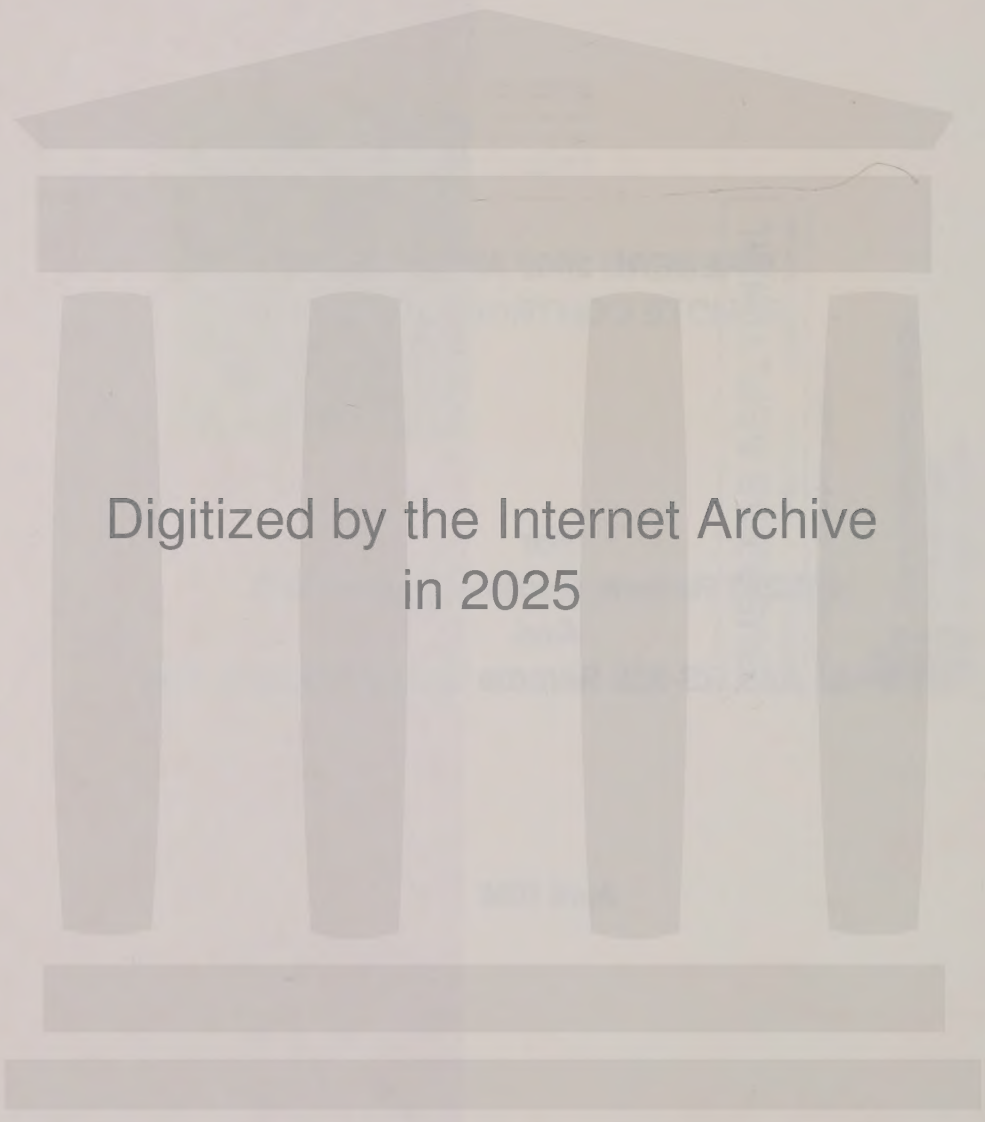
TELECOMMUNICATIONS TECHNIQUES CORPORATION
20410 Observation Drive
Germantown, Maryland 20876 U.S.A.
(301) 353-1550 Fax: (301) 353-0731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SECTION 1
INTRODUCTION

1.1 MANUAL APPLICABILITY

This manual is applicable to FIREBERD 2000 and FIREBERD 2000-1 test sets with RS-232 Rev. B Remote Control (Option 007) or IEEE-488 and RS-232 Rev. B Remote Control (Option 008). This manual is supplementary to the main FIREBERD manuals and it is assumed that the reader is familiar with the applicable main manual. For reference purposes, the main manuals are as follows:

FIREBERD 2000 : ML10220 dated December 1983 or later
FIREBERD 2000-1 : ML 10202 dated December 1983 or later
INTERFACE SWITCHING UNIT (ISU-2000) : ML10312

This manual is not applicable to FIREBERDs with IEEE-488 Interface (Option 001). This option was a limited capability IEEE-488 Addressable Talker Only interface with no remote control capability.

In the remainder of this manual, references to the FIREBERD or FIREBERD 2000 apply to both the FIREBERD 2000 and FIREBERD 2000-1 except where specifically noted.

This manual is intended for FIREBERDs with Rev. B remote control software. If your FIREBERD is equipped with Rev. A remote control software, or if you are unsure about the software revision, please see Appendix B for a list of functional differences between revisions.

1.2 CAPABILITY OVERVIEW

All FIREBERDs have a RS-232 Printer Interface provided as standard equipment. This interface allows printout of test results, control settings, and status

information under the control of front panel switches. When RS-232 Remote Control (Option 007) is provided, the RS-232 Printer Interface becomes a RS-232 Printer/Controller Interface. This interface allows complete control over the FIREBERD front panel switches (except POWER), and Interface Switching Unit port selection. Additionally, the user gains the ability to store up to five sets of front panel switch configurations in non-volitile memory for use at a later time as well as the added capability of many "Remote Control Only" functions.

When IEEE-488 and RS-232 Remote Control (Option 008) is provided, the complete capability of Option 007 is provided and additionally, an IEEE-488 Addressable Talker and Listener Interface is provided. This interface may be used to externally control the FIREBERD or may be used simply as an additional printer port.

The RS-232 Printer/Controller Interface is designed to work either in an interactive mode (including character echo and user prompts) for communicating with a device such as a terminal, or in a generally passive mode (with no echoes or prompts) for communicating with a host computer. The IEEE-488 Interface only supports remote control operation in Addressable mode. This mode operates similarly to the RS-232 passive mode in that no echo characters or prompts are generated. The IEEE-488 Talk Only mode does not allow remote control but does allow direct output to IEEE-488 Listen Only devices and does not require a bus controller.

The FIREBERD interfaces (RS-232 for Option 007, both RS-232 and IEEE-488 for Option 008) are also used as printer ports for any outgoing data. When both of these interfaces are provided, the remote controller may specify which port to use for normal printouts since they need not return to the controller. Note that controller responses, such as error messages, are always directed to the remote controller and not the current printer. The remote controller has the ability to initiate printouts at any time as well as the ability to delay or discard them.

1.3 MANUAL STRUCTURE

The remainder of this manual describes remote control operation via the RS-232 and IEEE-488 Interfaces as well as the use of the IEEE-488 Interfaces in Talk Only mode. Since this manual will make numerous references to the non-remote control FIREBERD operation, it is suggested that readers not familiar with the FIREBERD front panel and printer operation (as well as ISU operation if applicable) review those sections in the appropriate manual before proceeding. The following is a brief description of each manual section:

Section 2 Remote Control Set-Up:

This section provides information on connecting to the interfaces and setting the rear panel DIP switches which select operating parameters for the interfaces. Necessary interconnections for control of the Interface Switching Unit are described. Information is provided on an optional Remote Adaptor which allows a variety of connection possibilities to the RS-232 interface and provides the necessary connections for Interface Switching Unit control.

Section 3 Remote Control Checkout:

Test procedures are provided which allow verification of the remote control operation via the RS-232 and IEEE-488 Interfaces.

Section 4 Commands And Command Formats:

This section describes what events will place the FIREBERD in Remote Control mode and what events will return it to Local mode. It also describes the function and format for each available remote control command.

Section 5 Operating Information:

Procedures for sending commands to the FIREBERD and typical input/output sequences are described. Use of the printer ports is discussed and applications information is provided.

Appendix A Remote Control Sample Program:

Programs are provided which allows a Hewlett Packard 85 computer to control FIREBERDs via the IEEE-488 or RS-232 Interface.

Appendix B - Revision A Software Differences

This section provides a list of differences between the old Rev. A FIREBERD software and the new Rev. B software.

SECTION 2
REMOTE CONTROL SET-UP

2.1 INTRODUCTION

This section provides information on connecting to the interfaces and setting the rear panel DIP switches which select operating parameters for the interfaces. Necessary interconnections for control of the Interface Switching Unit (ISU) are described. Information is provided on an optional Remote Adaptor which allows a variety of connection possibilities to the RS-232 Interface and provides the necessary connections for ISU control.

2.2 RS-232 INTERFACE MODULE

The RS-232 Printer/Controller Interface is configured as data communications equipment (DCE) allowing it to be directly connected to data terminal equipment (DTE). The connector pinouts, RS-232 signal names and their functions as provided in this interface are shown in Table 2-1.

Data is exchanged through the RS-232 Interface in a serial asynchronous format with one start bit, seven data bits, an even or odd parity bit, and one or two stop bits. Data is coded in the seven-bit American Standard Code For Information Interchange (ASCII) and operation is possible at 300, 600, 1200, or 2400 baud. The optional line terminator provided at the end of each output line may be selected to be either a carriage return, a linefeed, or a carriage return-linefeed sequence. Table 2-2 shows how the RS-232 DATA FORMAT switch located on the FIREBERD rear panel may be set to select various operating parameters upon power-up.

In order to provide maximum operating flexibility, use of the RS-232 signaling leads has been minimized. The functions of the signaling and data leads are described as follows:

CTS (pin 5): This lead is driven to the ON state by the FIREBERD whenever it is ready to receive additional commands. This lead may be ignored by the controller if before issuing commands, it waits for the return of a Prompt character from the FIREBERD signifying the completion of the previous command.

DTR (pin 20): Data will only be output from the FIREBERD when this line is held ON by the receiving device.

RTS (pin 4): This lead is ignored by the FIREBERD.

DSR (pin 6) and RLSD (pin 8): These leads are driven to the ON state by the FIREBERD whenever it has power applied.

TX
Data (pin 2): The FIREBERD inputs control characters on this lead.

RCV
Data (pin 3): Data is output on this lead.

Sec
CTS (pin 13) and Sec RCV Data (pin 16): These leads provide +12 (RS-232 ON) and -12 (RS-232 OFF) for use in strapping signaling leads ON or OFF, respectively.

Pins 9, 10, 11, 18, and 25 are output signals used to control the Interface Switching Unit (ISU). Care should be taken not to drive these leads and not to connect them to any device other than the ISU.

Table 2-1

RS-232 Printer/Controller Interface Pin Assignments

Pin	RS-232 Description	Function
1	Protective Ground	Ground - Connected to chassis and circuit ground
2	Transmitted Data	Input
3	Received Data	Output
4	Request to Send	Input - Not Required
5	Clear to Send	Output - ON when FIREBERD is ready for on TX Data lead
6	Data Set Ready	Output - ON
7	Signal Ground	Ground
8	Received Line Signal Detector	Output - ON
9	Reserved For Data Set Testing	Output (TTL)-Spare - Do Not Connect
10	Reserved For Data Set Testing	Output (TTL)-REM: USE FOR ISU CONTROL
11	Unassigned	Output (TTL)-EN: USE FOR ISU CONTROL
13	Sec. Clear To Send	Output (RS-232) On
14	Sec. Transmitted Data	Output (RS-232): Spare
16	Sec. Received Data	Output (RS-232): Off
18	Unassigned	Output (TTL)-A1: USE FOR ISU CONTROL
20	Data Terminal Ready	Input - Must be ON for FIREBERD to send data on RCV Data lead
25	Unassigned	Output (TTL)-A0: USE FOR ISU CONTROL ONLY

Note: Unlisted pins are open.

Table 2-2

RS-232 Data Format Switch

SWITCH NUMBER	FUNCTION	SETTING
		300 600 1200 2400
1	Baud Rate	Down Up Down Up
2	Baud Rate	Down Down Up Up
3	Stop Bits	Up 2 Down 1
4	Sync Loss	Up Normal Down Option
5	Parity	Up Even Down Odd
6	Line Terminator (output only)	Up CR Down CR LF

Note: This switch is input only on power up, thus the FIREBERD power should be cycled if any changes are made.

2.3 IEEE-488 INTERFACE MODULE

The FIREBERD IEEE-488 Interface meets the specifications as stated in the IEEE Standard Digital Interface for Programmable Instrumentation (STD 488-1978). The interface has two basic modes of operation: Talk Only and Addressable.

In Talk Only mode, the FIREBERD is designed to drive a Listen Only device such as a Hewlett Packard 5150A Printer. In this mode, the FIREBERD directly drives the Listen Only device without a Controller present and no remote control capability is provided through the IEEE-488 Interface.

In Addressable mode, the FIREBERD may be connected to an IEEE-488 bus with up to 14 other devices present. One of these devices must be a controller to coordinate bus transactions. Full remote control capability is provided in this mode.

Table 2-3 shows parameter selections available via the IEEE-488 DIP switch located on the FIREBERD rear panel. Switch number 6 (the right-most switch) selects Talk Only or Addressable modes in the upper or lower positions, respectively. If Addressable mode is selected, switches 1 through 5 allow selection of bits 1 through 5 of the Talk and Listen Addresses. The address bits are numbered as specified in the IEEE-488 specification (bit 1 = LSB). Bits six and seven are automatically set to 01 and 10 for talker and listener addresses, respectively.

2.4 INTERFACE SWITCHING UNIT

The Interface Switching Unit (ISU) allows the user to change the FIREBERD interface without physically removing and inserting the interfaces.

The ISU is a rack-mountable device capable of supporting up to four interfaces and electronically selecting one interface for use with the FIREBERD.

Table 2-3

IEEE-488 Interface Control Switch

SWITCH NUMBER	FUNCTION	SELECTION
1	Address Bit 1 (LSB)	Up : 1 Down: 0
2	Address Bit 2	Up : 1 Down: 0
3	Address Bit 3	Up : 1 Down: 0
4	Address Bit 4	Up : 1 Down: 0
5	Address Bit 5 (MSB)	Up : 1 Down: 0
6	Mode	Up : Talk Only Down: Addressable

Note: Bits 6 and 7 of the address are automatically set to 01 and 10 for talker and listener addresses, respectively.

In addition to manual control, the ISU may be remotely controlled through the FIREBERD via the FIREBERDs RS-232 or IEEE-488 Printer/Controller Interfaces. This is accomplished by sending RS-232 or IEEE-488 commands to the FIREBERD which decodes the commands and passes them to the ISU via pins on the RS-232 Printer/Controller Interface Connector. To allow remote control of the ISU, the connections shown in Figure 2-1 are required.

2.5 REMOTE ADAPTOR

An optional Remote Adaptor (Model 30379) is available for use with the FIREBERD to accommodate a variety of interconnection situations. Figure 2-2 is a schematic for the adaptor which connects to the FIREBERD RS-232 Printer/Controller Interface and provides the following functions:

1. The necessary connections to the ISU for ISU remote control are provided.

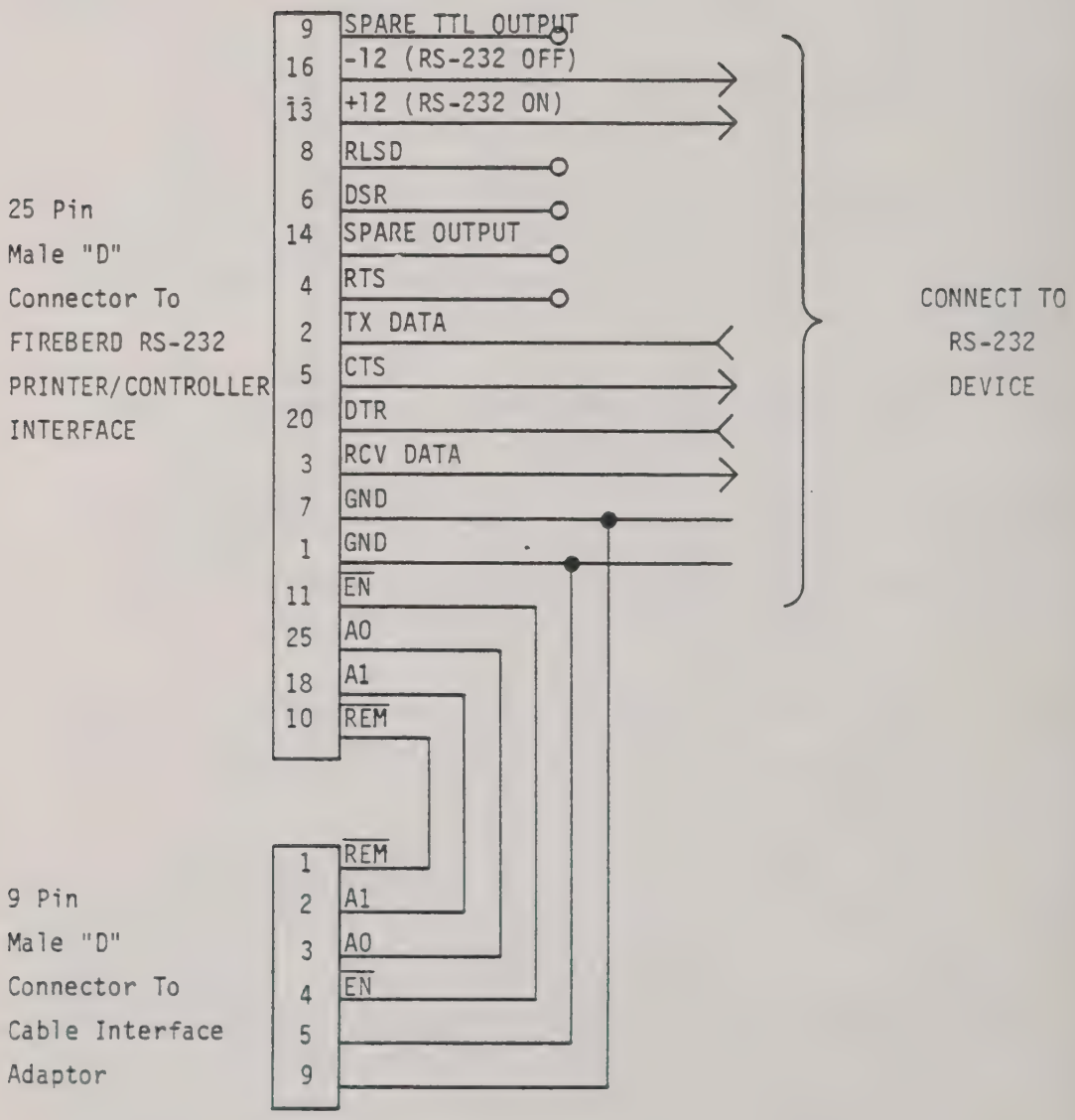
2. A 25-pin connector for connection of a modem or DCE to the FIREBERD is provided. The adaptor provides the necessary cross connections to allow the FIREBERD Printer/Controller Interface which is configured as a DCE to connect to another device configured as a DCE.

3. A 25-pin connector for connection to a terminal or DTE is provided. This connector cannot be used simultaneously with the DCE connector described in (2) above.

4. A 25-pin connector for connection to the PR2000 printer is provided. The printer may be simultaneously connected with the terminal or modem described in (2) or (3) above. Diode gating is provided to AND the DTR signal generated by the printer with either the DTR signal from the terminal or the CTS signal from the modem. This allows the printer, modem, or terminal to temporarily halt data transmission by holding the appropriate signaling lead OFF.

Figure 2-1

Connections To ISU



If desired, the position of a DIP switch on the Remote Adaptor may be changed to disconnect the printers DTR signal entirely. As long as the FAST or SUPER FAST* print mode is not selected (see the commands SLOW, FAST, and SUPER FAST), the printer will be provided with adequate time to print each line before additional data is output and the printer DTR signal will not be required. The advantage of this configuration comes about when the FIREBERD is controlled from a remote location through a modem and a printer is connected to the adaptor for local printout. If DTR is connected and the printer runs out of paper, the printer drops DTR and halts all outgoing communication from the FIREBERD and thus through the modem.

The PR2000 printer may be connected to the Remote Adaptor with the standard PR2000 printer cable provided with the printer. This cable straps the printer baud rate to 2400 and causes the printer to print in the standard Lister Format. This format causes printed characters to appear non-inverted when viewed at the front panel. When viewing a page of list mode printing, the last line printed is at the top of the page.

Alternatively, the PR2000 printer may be connected with straight through RS-232 male to female cable. With this type of connection, four sections of the DIP switch located inside the Remote Adaptor allow the printer baud rate to be set at 300, 600, 1200, or 2400 baud.

An additional DIP switch section allows selection of Lister or Text format printouts. In Text mode, printed characters appear inverted when viewed from the front panel. When viewing a page of Text mode printing, the last line printed is at the bottom of the page. Table 3-3 shows Remote Adaptor DIP switch positions required for various printer parameters.

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*The TERMINAL command automatically activates the SUPER FAST mode.

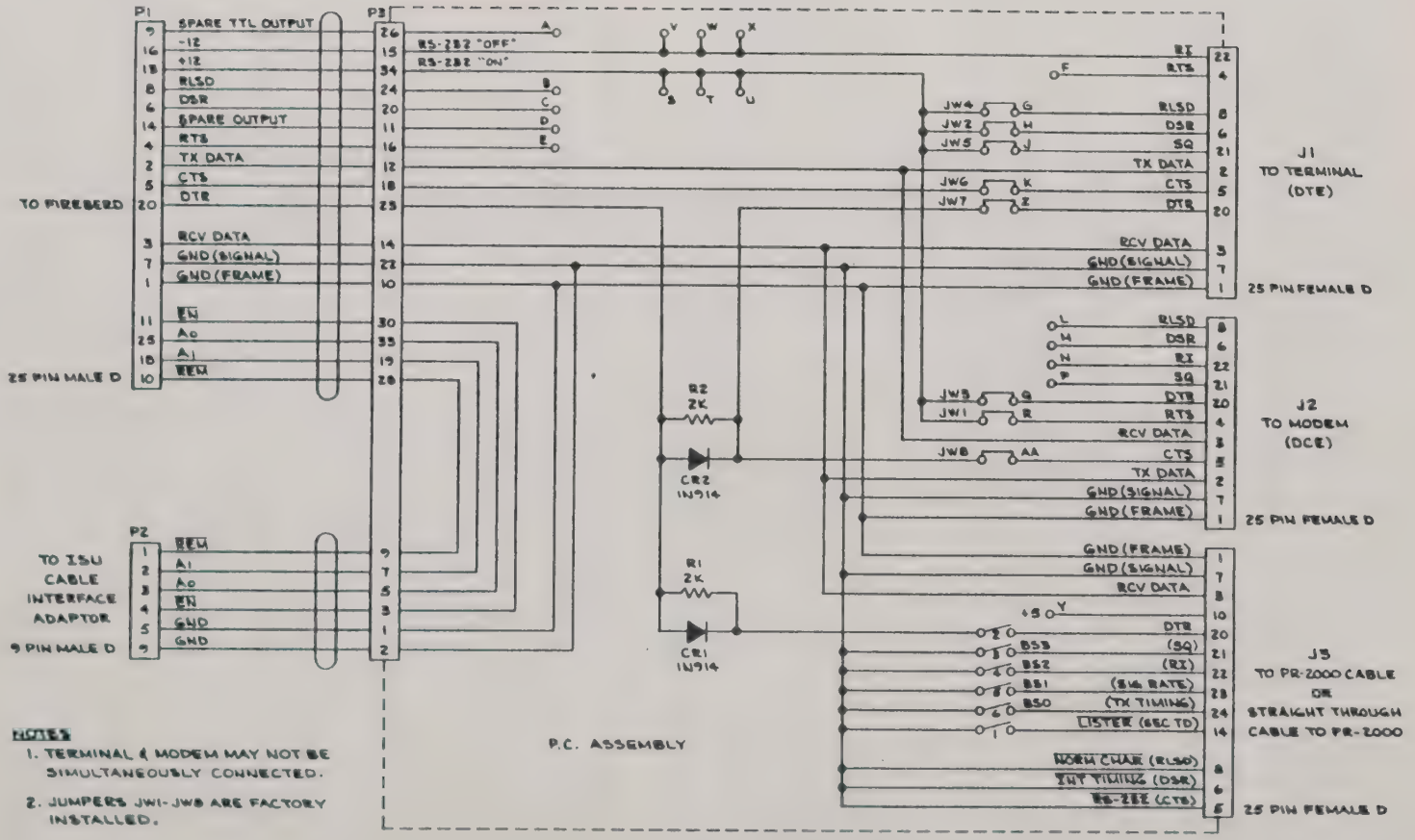

Figure 2-2

Remote Adaptor

Table 2-4

Remote Adaptor DIP Switch

SWITCH POSITION	FUNCTION	SELECTION			
1	Print Mode	ON OFF		Lister Text	
2	Printer DTR	ON OFF		Connected Disconnected	
		300	600	1200	2400
3	Baud Select 3	Off	On	Off	On
4	Baud Select 2	Off	Off	On	Off
5	Baud Select 1	On	Off	Off	Off
6	Baud Select 0	Off	On	Off	Off

NOTE: After connecting the PR2000 to the Remote Adaptor and setting the Remote Adaptor DIP switch, press the PR2000 TEST/FEED switch into the TEST position. This will initiate the PR2000 self test which may then be stopped by pressing the TEST/FEED switch into the FEED position. This action is required since the PR2000 only inputs the operating parameter selections on self test initiation and power up.

SECTION 3
REMOTE CONTROL CHECKOUT

3.1 INTRODUCTION

The following sections provide test procedures for verifying the remote control operation of the FIREBERD. The tests are broken into three groups, those related to RS-232 operation, IEEE-488 operation, and ISU operation. Note that these tests are to be performed after the tests outlined in the FIREBERD 2000 manual since they assume that the non-remote control sections of the FIREBERD are operative.

3.2 RS-232 REMOTE CONTROL INTERFACE CHECKOUT

This test is intended to check the operation of the RS-232 Interface through the use of a terminal which is configured as data terminal equipment.

The first step is to insure signaling compatibility. If the particular terminal being used does not output the DTR control line on, then it will be necessary to strap it ON on the FIREBERD side of the interface before any data outputs will occur. (Note that if DTR is being driven OFF by the terminal, then the terminal output control line must be disconnected from the FIREBERD's input control line before the input control line may be strapped ON.) The terminal need not monitor the CTS control line being output from the FIREBERD since the data output from the terminal will only be as fast as the operator can type, guaranteeing the FIREBERD adequate processing time between commands. The FIREBERD will hold DSR and RLSD ON which will satisfy most terminal requirements.

The next step is to set the FIREBERD and terminal interfaces to operate at the same baud rate, and data format. The RS-232 DATA format switch on the FIREBERD rear panel can be set to select the desired parameters (see Table 2-2). Most terminals will require the Line Terminator to be set for a carriage return and linefeed terminator. The RS-232 DATA FORMAT switch settings are only input on power up so the power must be cycled if the switch is changed with the power on.

Next set the RESULT HOLD/UPDATE/RESTART switch to the right of the FIREBERD's display to the UPDATE position and set the rear panel AUDIO INDICATOR switch to the HI or LOW position.

If the Remote Adaptor is used, the cable with the 25 pin D connector should be plugged into the FIREBERD RS-232 Printer/Controller Interface and the terminal may be connected to the connector marked "Terminal." If a straight through cable is to be used in place of Remote Adaptor, then the cable may be connected after it is verified that the Terminal does not drive, or that no connections are made to pins 9, 10, 11, 18, or 25 of the FIREBERD interface.

Turn on both the FIREBERD and the terminal; then make the proper connection.

1. The FIREBERD should power up in Local mode and output data to the terminal. Verify this by raising the PRINT CONTROLS toggle switch to the CONTROLS position. A controls print of the current front panel switch positions should be output to the terminal. If nothing happens, either the FIREBERD is under remote control or not receiving an ON condition on the DTR lead.

   Assuming that the FIREBERD is now running under local control, the only simple problem that could inhibit the RS-232 printouts is the DTR control line being received as OFF. Make sure that the FIREBERD is receiving DTR ON and recheck all cable connections, then try the test again.

2. Now send the FIREBERD the BEEP remote control command from the terminal. To do this, type the following four characters: "b e e p" followed by a carriage return or linefeed. The FIREBERD will not echo this command to the terminal, but should beep. If the FIREBERD beeped, then go on to the next test. Otherwise, the FIREBERD did not receive the remote control command or did not receive it correctly. If the FIREBERD responded with the fault message FAULT SYN (meaning that there was a syntax error in the command), then it is possible that some erroneous data

entered the FIREBERD's input command buffer when the terminal was turned on or connected. Try inputting the command again and proceeding from there. If the FIREBERD responded with FAULT PAR (parity error), FAULT FRA (framing error), FAULT OVR (overrun error), or did not respond at all, it may be that the FIREBERD and terminal data formats are not the same, the AUDIO INDICATOR switch is in the OFF position, or that the terminal requires some signaling lead to be held ON or OFF which is not driven by the FIREBERD.

3. The FIREBERD should have entered remote mode immediately following the reception of the BEEP command. To verify this, notice that the display now flashes "RS-232" approximately once every five seconds. Also note that none of the front panel switches on the FIREBERD (except the DISPLAY and POWER) have any effect. If this is not the case, then the FIREBERD never entered Remote mode so it must have never received the BEEP command.

4. Now send the FIREBERD the TERMINAL remote control command. To do this, type "t e r m i n a l" followed by a carriage return or a linefeed. Again, this command should not be echoed to the terminal.

   The FIREBERD should then respond by sending a new line command to the terminal (either carriage return or carriage return linefeed as selected by the rear panel RS-232 DATA FORMAT switch) followed by a prompt character (">"). If this is so, go on to the next test. Otherwise, the FIREBERD did not receive the command, or received it incorrectly and the data format selections on the FIREBERD and terminal should be checked.

5. Send the FIREBERD the STATUS remote control command. To do this, type "s t a t u s" followed by a carriage return or a linefeed. As you type this command, it should be echoed to the terminal and when the command has been completely entered, the FIREBERD should respond with a STATUS printout similar to the one given in Table 5-3.

6. Send the FIREBERD the LOCAL remote control command. To do this, type "l o c a l" followed by a carriage return or a linefeed. The FIREBERD should echo these characters to the terminal and when the command is completed, it should return to Local mode. Verify this by making sure that the FIREBERD's front panel switches now work correctly. If so, then the FIREBERD has passed the RS-232 remote control test.

3.3 IEEE-488 INTERFACE CHECKOUT

This test procedure is designed to work with a Hewlett Packard 85 (HP-85) computer with the IEEE-488 and I/O ROM options installed. To run this test, set the FIREBERD IEEE-488 rear panel DIP switch to addressable mode, address 00 according to Table 2-3. Make sure that the AUDIO INDICATOR switch on the FIREBERD's rear panel is set to either the HI or LOW position and the switch to the right of the FIREBERD's display is set to UPDATE. Turn both the HP-85 and the FIREBERD on and enter the test program in Table 3-1 into the HP-85. Connect the HP-85's IEEE-488 Interface cable to the FIREBERD's IEEE-488 Interface and disconnect any controller or printer from the RS-232 Interface. Press the "Run" key to run the test program and follow the test procedure that follows:

1. The FIREBERD should power up in Local mode. To verify this, raise the PRINT CONTROLS switch to the CONTROLS position and see that a controls print of the current state of the FIREBERDS front panel appears on the HP-85's display.

2. Now press the (K1) key on the HP-85 keyboard and then enter the BEEP command. To do this, type "b e e p" followed by the End Line key. The FIREBERD should now beep. If it does not, make sure that the rear panel AUDIO INDICATOR switch is in either the HI or LOW position.

3. The FIREBERD should have entered Remote mode immediately following the reception of the BEEP command. Verify this by noting that the FIREBERDS display now flashes "IEEE488" approximately once every five seconds and that none of the front panel switches are active (except the DISPLAY and POWER). If this is not so, then the FIREBERD did not receive the BEEP command and has not entered Remote mode.

4. Send the FIREBERD the STATUS command. To do this, press the (K1) key on the HP-85's keyboard and then type "s t a t u s" followed by the (end line) key. The FIREBERD should respond by sending a status printout to the HP-85 display similar to the one given in Table 5-3.

5. Send the FIREBERD the LOCAL command. To do this, press the (K1) key on the HP-85's keyboard and then type "l o c a l" followed by the (end line) key. The FIREBERD should now return to Local mode. Verify this by raising the PRINT CONTROLS switch to the CONTROLS position and noticing that a controls print appears on the HP-85 display. This completes the IEEE-488 test.

3.4 INTERFACE SWITCHING UNIT REMOTE CONTROL CHECKOUT

This test procedure allows verification of the remote control operation of the Interface Switching Unit (ISU). The ISU's cable interface should be plugged into the FIREBERD interface slot. Connections should be made between the cable interface and the FIREBERD RS-232 Printer/Controller Interface with the Remote Adaptor described in Section 2.5 or as described in Section 2.4. An RS-232 terminal or an HP-85 computer should be connected to the appropriate interface to act as a controller. Power up each of the devices and verify that the controller is communicating with the FIREBERD with the procedure in Section 3.2 or 3.3. Then proceed as follows:

Table 3-1

IEEE-488 Test Program

```
10 DIM I$[32],O$[32]
20 ENABLE KBD 255-16
30 Z$=CHR$(13)&CHR$(10)&CHR$(10)&CHR$(1)
40 CONVERT IN 7 PAIRS ; Z$
50 CLEAR
60 REM
70 REM IEEE-488 ADDRESSABLE
80 REM
90 ON KEY# 1 GOSUB 240
100 SET TIMEOUT 7;1000
110 ON TIMEOUT 7 GOTO 120
120 ABORTIO 7
130 S=SPOLL(700)
140 IF BINAND(S,1)=1 THEN DISP "FAULT SYN"
150 IF BINAND(S,2)=2 THEN DISP "FAULT OVF"
160 IF BINAND(S,128)=0 THEN 130
170 ENTER 700 USING "%,%K" ; I$
180 IF I$="" THEN 220
190 IF I$[1,1]<>CHR$(1) THEN 210
200 I$=I$[2,LEN(I$)]
210 IF I$=CHR$(0) THEN 130
220 DISP "   - ";I$   .
230 GOTO 130
240 REM
250 REM SEND IEEE-488 COMMAND
260 REM
270 DISP "ENTER COMMAND ";
280 INPUT O$
290 IF LEN(O$)=0 THEN 320
300 ON TIMEOUT 7 GOTO 330
310 OUTPUT 700 USING "K" ; O$
320 GOTO 350
330 DISP
340 DISP "*** UNIT NOT RESPONDING ***"
350 ON TIMEOUT 7 GOTO 120
360 RETURN
```

1. The ISU should currently be in Local mode. Verify this by noting that the LOCAL LED on its front (or rear) panel is illuminated and that the port select switches function properly. If this is not the case, then recheck the ISU connections to the FIREBERD and attempt the test again after turning the FIREBERD off and back on again.

2. Now, through the remote controller previously hooked up to the FIREBERD, send the command "ISU 2". The ISU should then switch to port number two and the REMOTE LED should light indicating that the ISU is now under remote control. The ISU front panel switches should no longer be active.

3. Now send the command "ISU 1" to the FIREBERD followed by the commands "ISU 3" and "ISU 4" noting that after each command is received by the FIREBERD, the ISU switches to the selected port and the REMOTE LED is illuminated.

4. Send the command "ISU LOCAL" to the FIREBERD. The ISU should now return to Local mode. Verify this by noting that the LOCAL LED is now lit and that the ISU front (or rear) panel switches are once again active. This completes the ISU checkout procedure.

SECTION 4
COMMANDS AND COMMAND FORMATS

4.1 INTRODUCTION

This section provides a detailed description of all FIREBERD functions available to the user. It is divided into three parts, first a general description of Remote and Local operating modes, followed by the command format and structure, and finally a list of all remote control commands and their functions. It is recommended that the reader become familiar with the functions presented here before proceeding on to the next section as that section will make numerous references back to this one.

4.2 REMOTE AND LOCAL MODE OPERATION

The FIREBERD always operates in either Remote or Local mode. In Local mode, the only mode available to non-remote controllable FIREBERDs, all control is provided from the front panel switches and the user has very limited control over any internal operations. Remote mode allows the FIREBERD to be controlled through one of its remote control ports and allows all the operations available in Local mode as well as many additional ones. When Remote mode is initiated, the current front panel switch settings are used as a basis for remote operation. Once the FIREBERD is in Remote mode, the front panel switches are ignored until the remote controller returns the FIREBERD to Local mode operation or the power is cycled.

4.3 REMOTE CONTROL COMMAND FORMATS

Remote control commands are sent from the remote controller to the FIREBERD through one of the remote control ports on the FIREBERD's rear panel. The procedure for issuing commands to the FIREBERD is discussed in Section 5. This section describes the command formats and functions.

Remote control commands are usually made up of one or two substrings consisting of ASCII printable characters. The first substring is the command identifier and the second (sometimes not required) is a parameter selection for the identified command. All ASCII space and null characters (20H and 00H, respectively) are ignored in command decoding allowing the user to freely insert them wherever desired. All commands may be entered in either lower or upper case.

The FIREBERD supports simple editing functions while it is inputting data from the controller. Reception of a CONTROL H character (ASCII backspace, 08H) will cause the most recently input character to be discarded allowing the controller to re-transmit it.

Reception of a CONTROL X character (ASCII cancel, 18H) will cause the entire line currently being input to be discarded allowing the controller to restart the command transmission from the beginning.

All remote control commands sent to the FIREBERD must be followed by a terminator sequence to indicate that the command is completed and should be interpreted. A terminator sequence is defined as any one or combination of the following:

1. A carriage return (CR, 0DH)

2. A linefeed (LF, 0AH)

3. Any character sent with the EOI line asserted (IEEE-488 only)

4.4 REMOTE CONTROL COMMANDS

The following is a list of all remote control commands available to the user. It is broken down into four sections. First, front panel switch control commands are described followed by the general remote control commands and finally two sections on RS-232 and IEEE-488 remote controller specific commands. Each command will be listed along with all of its possible parameters, each described as necessary. This section assumes that the reader is familiar with the front panel operation of the FIREBERD.

4.4.1 Front Panel Switch Commands

The remote controller is provided with the ability to read, and change if desired, the position of any FIREBERD front panel switch (except POWER). In order to read the current position of any switch, the controller need only send the switches name and the FIREBERD will return the current switch positions to the printer interface. To change the position of a switch, the controller must send the switch name followed by its new position. The FIREBERD will then set the switch appropriately.

Due to the length of some switch and position names, an abbreviated format has been adopted for sending remote control commands to the FIREBERD. All words in the switch or position names are shortened to their first three letters. Numbers are sent unchanged and exponents are represented by an up arrow " " (ASCII circumflex 5EH) character.

The following front panel switch list is ordered the same as the description in the FIREBERD manual section 4. Each switch will be followed by a list of its possible positions in parenthesis.

GEN CLO (1.2, 2.4, 4.8, 9.6, 19.2, 56, 64, FA, FB, FC, FD, EXT)

This command sets the GENERATOR CLOCK switch to the position specified. For the FIREBERD 2000-1, the switch positions are as follows:

(2.4, 4.8, 9.6, 19.2, 56, 112, 224, 448, FA, FB, FC, EXT)

PAT (MK, SP, 1:3, 63, 511, 2047, 2 15-1, 2 20-1)

This command sets the PATTERN switch to the specified pattern.

ERR INS (10 -3, OFF, SIN)

This command sets the ERROR INSERT switch to the specified position. Since the ERROR INSERT switch is momentary in the SINGLE position, after the ERR INS SIN command is entered, the ERROR INSERT switch will return to the OFF position following the error insertion.

ERROR

This command is equivalent to the ERR INS SIN command. It inserts a single error into the transmit data stream.

DIS (BER, ERR, SEC, ERR SEC, BLK, BLK ERR, TIM, DAT)

This command sets the DISPLAY switch to the position specified. This command is only active if the FIREBERD's display is under remote control. See the DISPLAY command.

MOD (ERR ANA, TX FRE, RCV FRE)

This command sets the MODE switch to the position specified.

BLK LEN (400, 1K, 4K, 10K, 40K, 100K)

This command sets the BLK LENGTH switch to the position specified.

FRE TES LEN (AUT, 10 5, 10 6, 10 7, 10 8, 10 9)

BER TES LEN (AUT, 10 5, 10 6, 10 7, 10 8, 10 9)

These commands set the BER TEST LENGTH switch to the position specified. For the FIREBERD 2000-1, the available positions are (AUT, 10 6, 10 7, 10 8, 10 9, 10 10). Note that the alternate command "FRE TES LEN" is identical to the "BER TES LEN" command and is provided for convenience in setting the frequency test length interval.

AUT SYN (ENA, DIS)

This command sets the AUTO SYNC switch to the position specified.

RES HOL

This command sets the switch at the right of the display to the RESULT HOLD position causing the display to stop updating.

UPD or UP DAT

This command sets the switch at the right of the display to the UPDATE position allowing it to continue updating.

RES

This command sets the switch at the right of the display to the RESTART position causing a test restart. Since this switch is momentary, it will be returned to the UPDATE position after the test restart has been initiated.

LOO TES (NOR, LOO)

This command sets the LOOP TEST switch to the specified position.

PRI CON (CON, AUT, RES)

This command sets the PRINT CONTROL switch to the specified position. The commands PRI CON CON and PRI CON RES will initiate controls and results printouts, respectively. Since this switch is momentarily, it will return to the AUTO position once the selected printout has been initiated.

CONTROLS

This command is equivalent to the PRI CON CON command and initiates a controls print.

RESULTS

This command is equivalent to the PRI CON RES command and initiates a results print.

EVE (OFF, ERR, 1, 10, 30, BER CYC, FRE CYC, STA, NNNN)

PRI EVE (OFF, ERR, 1, 10, 30, BER CYC, FRE CYC, STA, NNNN)

These commands set the EVENT switch to the specified position allowing automatic printouts to be generated as desired. The STA (for STATUS) position of the EVENT switch does not correspond to a front panel position and is only accessible through remote control. With the EVENT switch in the STA position, status messages such as SYNC LOSS and SYNC ACQUIRED may occur but no results prints will be initiated automatically as they are with the EVENT switch set to the other positions (excluding OFF). Note that while the 1, 10, and 30 minute positions from the front panel still exist, the FIREBERD may now be set to print on any time interval between

1 and 9999 minutes by using the "EVE NNNN" command where NNNN is the desired time interval. Note also that the "BER CYC" and "FRE CYC" positions are alternate names for the same position.

RS or RTS (ON, OFF)

This command sets the REQUEST TO SEND control line to the desired state. Note that this command is only recognized when the FIREBERD is operating as DTE.

RR or RLS (ON, OFF)

This command sets the RECEIVER READY or RECEIVE LINE SIGNAL DETECT control line to the specified state. Note that this command is only recognized when the FIREBERD is operating as DCE.

TR or DTR (ON, OFF)

This command sets the DATA TERMINAL READY control line to the desired state. Note that this command is only recognized when the FIREBERD is operating as DTE.

DM or DSR (ON, OFF)

This command sets the DATA MODE or DATA SET READY control line to the desired state. Note that this command is only recognized when the FIREBERD is operating as DCE.

4.4.2 General Remote Control Commands

Following is a list of general remote control commands which may be used by either an RS-232 or IEEE-488 remote controller. These commands are used to control various remote control functions not accessible through the front panel of the FIREBERD. Each command name is followed by a list of its allowable parameters, and then by a description of the command and any additional pertinent information.

Certain commands, identified by an asterisk (*) next to their list of command parameters, may be used both to set the selected function as well as to send its current state to the printer. As with other commands, in order to set the function, the controller must send both the functions name and its newly selected parameter. In order to have the functions current state sent to the printer, the controller must send only the function's name (without any selecting parameters.)

AUDIO (ENABLE, DISABLE)*

The AUDIO ENABLE command allows the FIREBERD's beeper circuitry to operate normally, that is, as specified by the rear panel AUDIO INDICATOR switch. The AUDIO DISABLE command disables all beeps irrespective of the position of the rear panel AUDIO INDICATOR switch. The power up condition for this function is AUDIO ENABLE.

BEEP

This command instructs the FIREBERD to sound its beeper once, provided that neither the AUDIO function is set to DISABLE nor the rear panel AUDIO INDICATOR switch is in the OFF position.

CLEAR

This command returns the FIREBERD to a power-up state. It also outputs the message DEVICE CLEAR to the printer provided that the EVENT switch is not in the OFF position.

CLEAR FIFO

This command clears the FIREBERD's print FIFO.

CONT

This command is one of the Interval Analysis commands. When "CONT" is received, the FIREBERD will continue testing and accumulating results from the point at which testing was stopped. If testing was stopped due to the activation of the "RUN" command, then the RUN is reactivated. See the RUN and STOP commands.

DATE (MM/DD)*

This command sets the FIREBERD's real time clock to the data specified where MM is the month and DD is the day.

DISABLE (Printout Name or ALL)*

This command disables the selected printout inhibiting its transmission to the printer. The printout options include most of the status messages (such as SYNC LOSS) as well as most of the individual lines of the RESULTS print. The DISABLE ALL command disables all printouts which can be disabled. All printouts are in the ENABLE mode (except possibly the SIGNALING CHANGE printout which is set according to a jumper in the FIREBERD) upon power-up or device clear. The printout names are derived by abbreviating the printout just like switch names (i.e., the first three letters from each word). They are as follows:

Printout Name (abbrev)	Printout
% ERR FRE SEC	results % error free seconds
% VIO FRE SEC	results % violation free seconds
---	results print dashed line
***	switch change printout
ABE	average BER printout
ABV	average BVR printout
AMI VIO	results AMI violations
AVR	average VR printout
BER	results BER
BLK BPV	results block BPV
BLK ERR	results block error
BLK VIO	results block violation
BLK	results blocks
BPV SEC	results BPV-seconds

Printout Name (abbrev)	Printout
BPV	results BPV
BVR	results BVR
CLO LOS	clock loss printout
DAT LOS	data loss printout
ERR SEC	results error-seconds
ERR	results errors
FOR RES	forced resync printout
HDB VIO	results HDB3 violations
NO SYN	no sync printout
SEC	results seconds
SIG CHA	signaling change printout
SIG	signaling (i.e., control lines status)
SYN ACQ	sync acquired printout
SYN LOS	sync loss printout and result
TES RES	test restart printout
TIM	time, date, and ID# line
VIO SEC	results violation-seconds
VR	results VR

With these options it is now possible to custom tailor the RESULTS print (as well as the other status messages) so that only the desired information will be printed. For example, if you are not interested in knowing the BER or ABER during a series of tests, you need only enter the commands "DISABLE BER" and "DISABLE ABE" and they would no longer be included with the results print. Similarly, if you were not interested in the time, date, and ID#, you could enter the command "DISABLE TIM" and the time, date, and ID# would no longer be included in any printouts.

DISPLAY (LOCAL, REMOTE)*

The DISPLAY LOCAL command causes the FIREBERD's DISPLAY switch to act under front panel control. The DISPLAY REMOTE command allows the DISPLAY switch to be remotely controlled while the FIREBERD is under remote control (through the use of the DIS switch remote control command). The DISPLAY function powers up in the LOCAL condition.

ENABLE (Print Out Name or ALL)*

This command operates exactly like the DISABLE commands described earlier except that it ENABLES the selected printout, allowing them to occur.

FAST

SLOW

SUPERFAST

These commands determine the delay time after each line output to the RS-232 Interface before the state of the DTR line is tested. When the SLOW mode is selected, the FIREBERD will wait approximately 800 milliseconds after completing each printed line to the RS-232 Interface before continuing on to check the DTR control line. The FAST mode reduces this delay to 50 milliseconds, and the SUPER FAST mode bypasses this delay entirely, allowing the FIREBERD to continue printing at its full speed. The FIREBERD powers up in SLOW mode.

FREQ INT (VARIABLE, 1 SEC)*

This command selects the desired measurement interval for future frequency tests. When the VARIABLE option is selected, the BER TEST LENGTH switch will determine the frequency test interval; otherwise, the test length defaults to one second. Note that issuing the FREQ INT command causes a test restart to occur. The FIREBERD powers up in the mode selected by an internal jumper.

FORMAT

UNFORMAT

The FORMAT command instructs the FIREBERD to format all FIFO printouts with spaces as required. The UNFORMAT command instructs the FIREBERD to delete all spaces in the outputs. Note that since RS-232 echo and error messages do not pass thru the print FIFO, they are not affected by these commands. The FIREBERD powers up in FORMAT mode.

HELLO

This command returns the software revision level to the printer.

HELP (command or switch name)

When entered without any parameters, the HELP command causes the FIREBERD to output a list of all recognizable command and switch names to the printer. When entered followed by a switch or command name, the HELP command causes the FIREBERD to output a list of all of the switches allowable positions or the commands allowable parameters to the printer.

HOLD

REL

Initiation of a HOLD command causes the FIREBERD to delay all FIFO outputs until a REL (release) command is received or the FIREBERD is returned to LOCAL mode.

ISU (1, 2, 3, 4, LOCAL)*

When followed by a port number (1 thru 4), the ISU command causes the ISU to enter Remote mode and select.the specified port. The command ISU LOCAL causes the ISU to return to Local mode.

PRI (Result)

The PRI command allows one to obtain individual result values from the FIREBERD without going through a results print. The results names are abbreviated to the first three letters of each word of the label. They are as follows:

Result Name	Result
% ERR FRE SEC	percentage of error free seconds
% VIO FRE SEC	percentage of violation free seconds
ABE	average BER

Result Name	Result
ABV	average BVR
BER	bit error rate
BLK ERR	block errors
BLK BRV	block BPVs
BLK VIO	block violations
BLK	blocks
BPV SEC	BPV seconds
BPV	bipolar violations
BVR	bipolar violation rate
ERR SEC	errored seconds
ERR	errors
FRE	frequency
SEC	seconds
SYN LOS	sync losses
VIO SEC	violation seconds
VIO	violations
VR	violation rate

Note that error analysis results may not be called out from frequency mode and vice versus.

PRINT (232, 488, AUTO)*

This command selects the device to be used for printer outputs. When the PRINT 488 or PRINT 232 command is issued, all further printouts will be routed to the RS-232 or IEEE-488 Interface, respectively until either the FIREBERD is turned off or the PRINT command is overridden with a new one. When the command PRINT AUTO is issued, the FIREBERD will implement an automatic printer device selection feature identical to that provided in non-remote control operation. In this mode, when a printout is ready to begin, if the DTR control line is OFF, then the printout will be sent to the IEEE-488 Interface until DTR becomes ON (at which point the printout would switch back to the RS-232 Interface. Once printout is initiated to the RS-232 Interface, the FIREBERD will wait for DTR to go ON before sending each character. The PRINT function powers up in AUTO mode.

RUN

This command activates the Interval Analysis mode. Entering the "RUN" command will first cause a Test Restart. Once synchronization is acquired all error analysis functions will continue as normal until the end of the interval event occurs as identified by the selection of the Print Event switch (e.g. If Event Switch is set for 10 minutes, then test will continue for 10 minutes and stop). When the interval is complete, all analysis and automatic printer functions stop and all results are frozen.

When a Run is in process (meaning the ongoing test will stop automatically when the Print Event is satisfied) that fact will be declared in the results printout as "RUN IN PROCESS".

STORE (0 thru 4)

RECALL (0 thru 4)

These commands allow the user to store and recall up to five sets of front panel switch configurations in non-volitile memory as addressed by the command parameter (a number, 0 through 4). Since these configurations are stored in non-volitile memory, they are not lost when the power is turned off.

SRQ (ALL, ERROR)*

This command determines when the FIREBERD will generate a service request to the IEEE-488 Interface. The command SRQ ERROR will cause the FIREBERD to generate a service request only when it receives a remote control command error. The SRQ ALL command allows the FIREBERD to generate a service request for either an error condition (as the SRQ ERROR command) or when it has printer data to transmit. Note that an error service request must be acknowledged by a serial poll from the controller before any more printouts may occur. Since the SRQ selection status is stored in non-volitile memory, its value on power-up will be the same value it had on the previous power-down.

STOP

This command manually stops the ongoing analysis and freezes all results. Analysis can be continued by entering the "CONT" command.

STATUS

This command initiates a status printout[1] from the FIREBERD. The status printout contains the currently selected FIREBERD remote control functions listed as follows:

FORMAT/UNFORMAT	
FAST/SLOW/SUPER FAST	
TERM 232	(CR, CRLF, LF, NONE)
TERM 488	(CR, CRLF, LF, NONE)
PROMPT	(ON, OFF)
ECHO	(ON, OFF)
SRQ	(ALL, ERROR)
REN	(CHR, 488)
PRINT	(232, 488, AUTO)
DISPLAY	(LOCAL, REMOTE)
AUDIO	(ENABLE, DISABLE)
ISU	(1, 2, 3, 4, LOCAL)
FREQ INT	(VARIABLE 1 SEC)
SYNC LOSS	(NORMAL, OPTION)

See Table 5-3 for a sample STATUS printout.

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[1]Note that a status printout is different from a status message. The term status message refers to SYNC LOSS, SYNC ACQUIRED, and a variety of other messages described in the main FIREBERD manuals.

SYNC LOSS (NORMAL OPTION)*

This command determines how the FIREBERD will respond to a loss of sync. In SYNC LOSS NORMAL mode, normal operation occurs; that is, the FIREBERD will resync and restart the test clearing all previous results. In SYNC LOSS OPTION mode, the FIREBERD will continue accumulating results and resync without restarting the test. The FIREBERD powers up in the mode selected by the RS-232 DIP switch #4.

SW 4	UP	=	NORMAL
SW 4	DOWN	=	OPTION

Note that this option is only available on specially modified FIREBERDS. Consult TTC for assistance in determining if your FIREBERD has been modified.

TERM 232 (CR, CRLF, LF, NONE)*

TERM 488 (CR, CRLF, LF, NONE)*

These commands select the terminator sequence (carriage return, carriage return-linefeed, linefeed, or none) that will be appended on the end of every line output from the RS-232 or IEEE-488 Interface. The TERM 232 function powers up in the state selected by the rear panel RS-232 DIP switch. The TERM 488 function powers up set to CRLF for Talk Only mode, or set to its previous value before the last power-down for Addressable mode.

TEXT

Sending this command causes the FIREBERD to send all characters subsequently received from the controlling interface to the selected printer device until the reception of a control W character (ASCII ETB = 17H). This command is useful for allowing the controlling device to provide labels on the printouts.

TIME (HH:MM)*

This command sets the FIREBERD's 24-hour real time clock to the specified time. Note that the seconds are always set to 00.

4.4.3 RS-232 Controller Specific Commands

The following commands are usable only by an RS-232 controller. They enable the user to configure the FIREBERD to communicate with a variety of devices, from dumb terminals to host computers. Each command is followed by a list of its allowable parameters in parenthesis and a description of the commands function.

ECHO (ON, OFF)*

When the ECHO function is ON, all received characters will be echoed back to the controller. The exceptions to this are as follows:

1. Unrecognizable control characters will be echoed as an ASCII period (2EH) ".". This allows the user to see them and delete them with the back space key.

2. The ASCII back space character (08H) will only be echoed if the input command buffer was not already empty when the character was received.

3. The ASCII cancel or control X character (18H) will echo as the selected output terminator sequence.

4. Incoming terminator sequences will echo as the selected output terminator sequence.

5. No additional characters (except a terminator) will be echoed once the command buffer is full.

The ECHO function powers up in the OFF condition.

REMOTE

LOCAL

These commands are used to enter the FIREBERD into Remote or Local mode. Note that while the reception of any command (not just REMOTE) will cause the FIREBERD to enter Remote mode, only REMOTE will do so without doing anything else.

The FIREBERD powers up in LOCAL mode. Note that the backslash ("/") command may also be used to set the FIREBERD to LOCAL mode.

PROMPT (ON, OFF)*

When the PROMPT ON function is selected, a prompt character (ASCII ">" = 3EH) will be output whenever the FIREBERD completes the interpretation of a remote control command and is ready for a new one. Additionally, prompts will be output whenever a FIFO printout is completed or when one is interrupted by the reception of a remote control command character (which will also initiate a temporary hold). No prompts are output when the PROMPT OFF function is selected. The FIREBERD powers up with the PROMPT function in the OFF condition.

TERMINAL

Entering this command sets the FIREBERD up to communicate with a dumb terminal. Specifically, it sets the following functions:

PROMPT ON
ECHO ON
SUPER FAST
TERM 232 CRLF

Note that the period character (".") will also act as the Terminal command.

4.4.4 IEEE-488 Controller Specific Commands

The following commands are only usable through an IEEE-488 Interface. The commands are grouped in two categories - character commands and special commands.

4.4.4.1 Character Commands

REN (488, CHR)*

This command is used to select the remote enable mode to be used with the IEEE-488 remote controller. The REN 488 command selects true IEEE-488 defined remote control.

In this mode, the only way to enter the FIREBERD into remote mode is to send it MLA while the REN line is held true. The only way to then re-enter local mode is to either send the GTL command or to make the REN line false. The command REN CHR selects the special character based remote mode where the REN line is ignored and the REMOTE and LOCAL commands are used to enter the FIREBERD into remote and local modes, respectively.

The REN function powers up in the CHR condition.

REMOTE

LOCAL

These commands may only be used by the IEEE-488 controller when the REN CHR function has been selected. These commands then serve to enter the FIREBERD into Remote and Local modes, respectively. Note that although the reception of any valid remote control command will cause the FIREBERD to enter Remote mode, the REMOTE command is the only one which will do so without doing anything else. Note that the backslash ("/") command may also be used to set the FIREBERD to local mode.

4.4.4.2 Special Commands

The FIREBERD responds to the IEEE-488 uniline universal commands and the serial Poll Enable and Serial Poll Disable multiline universal commands according to the IEEE-488 specification. Other commands described in, but not totally defined by the IEEE-488 specification are described below.

DEVICE CLEAR

SELECTED DEVICE CLEAR

These commands return the FIREBERD to the power-up state. They also cause a DEVICE CLEAR message to be sent to the printer provided that the EVENT switch is not in the OFF position. The response to these commands is identical to the response to the CLEAR character command.

GROUP EXECUTE TRIGGER

This command initiates a test restart and is equivalent to the RESTART switch position.

REMOTE ENABLE

This line is ignored when in character based Remote mode. In true IEEE-488 Remote mode, this line determines the source of input information. When it is false, the front panel switches control the FIREBERD. When it is true and the FIREBERD receives MLA, the switches are ignored and the remote controller is the source of input information.

NOTE: Upon entering Remote mode, the current switch positions are used as a basis for operation.

SECTION 5
OPERATING INFORMATION

5.1 INTRODUCTION

When the FIREBERD first powers up, it is in Local mode. It then scans both the RS-232 (with the CTS control line output true) and the IEEE-488 Interfaces for any sign of remote control (the reception of a command for RS-232 or a character for IEEE-488 character based Remote mode, or the reception of MLA while the REN line is driven true for IEEE-488 spec Remote mode). When either port becomes active, it gains remote controller status and the other port is ignored from then on. If the IEEE-488 Interface gains remote controller status then the RS-232 CTS control line will be output false, indicating that the RS-232 port is no longer being serviced. If the RS-232 Interface gains remote controller status then the IEEE-488 port will only be scanned for the DEVICE CLEAR function. This insures that the IEEE-488 has priority over the RS-232 in controlling situations where both are connected.

5.2 CONTROLLING THROUGH THE RS-232 INTERFACE

Once the RS-232 Interface has gained remote controller status, it may proceed to control the FIREBERD. The FIREBERD will enter Remote mode whenever it receives a valid remote control command (except LOCAL). The only way to return to Local mode is to send the LOCAL command or turn the power off. The process for sending remote control commands to the FIREBERD is as follows:

1. The FIREBERD is holding the CTS control line in the ON condition.

2. The controller sends the first character of a remote control command. Upon reception of this character, the FIREBERD enters a temporary print output Hold mode, all printer outputs will be delayed until the hold is released.

This serves to keep all FIREBERD responses (such as echoes, error messages, and prompts) together as opposed to having them spread throughout any ongoing printouts.

If the FIREBERD ECHO function is enabled, then the character just input will be echoed.

3. The controller sends the remaining characters in the remote control command, each being echoed if the function is enabled.

4. The controller sends a terminator sequence indicating to the FIREBERD that the remote control command is finished. The FIREBERD then lowers its CTS control line to the OFF condition to indicate to the controller that command processing has begun. The selected output terminator sequence will then be echoed if the ECHO or PROMPT features are enabled.

5. Once the FIREBERD has interpreted the remote control command, if there were any errors, then an appropriate fault message response is generated (see Table 5-1 for a listing of the RS-232 fault messages and their meaning). If the command was valid (meaning there were no errors), then the FIREBERD now enters Remote mode.

6. If the PROMPT feature is enabled, the FIREBERD will output a prompt character (">"). The CTS control line will then be turned ON signifying that the previous remote control command has been processed and the FIREBERD is ready for a new one.

   The FIREBERD will now release the temporary print hold allowing any accumulated FIFO outputs to continue.

Table 5-1

RS-232 Fault Messages

FAULT XXX, XXX, XXX ... terminator

where

XXX is the error code as defined below. Note that multiple error codes can be output at once.

XXX		Error
SYN	=	command syntax error
OVF	=	command overflow error
OVR	=	UART input overrun error
PAR	=	UART input parity error
FRA	=	UART input framing error

If the controller chooses to ignore the CTS control line and the PROMPT feature, then it must delay adequately after sending the FIREBERD each command to ensure that all related processing has finished and all outputs are complete. If the FIREBERD receives a second command before it finishes processing the previous one, error responses, echoes, and prompts may be associated with the wrong command or lost due to internal overflows. If response data is lost due to this situation occurring, the string "(OVF)" will be imbedded in the controller response message at the point of the overflow.

5.3 CONTROLLING THROUGH THE IEEE-488 INTERFACE

The FIREBERD supports two modes of IEEE-488 remote control operation, one as defined by the IEEE-488 specification (set by the REN 488 command) including the full use of the IEEE-488 REN line, and another more versatile character based remote mode (set by the REN CHR command) which does not require the controller to tie up the remote line while talking to the FIREBERD. The difference between the modes pertains to the methods for entering and exiting Remote mode. In the true IEEE-488 spec mode, the only way to enter the FIREBERD into Remote mode is to send MLA while the REN line is driven true. To then return the FIREBERD to Local mode the controller must either send the GTL command or set the REN line false. Note that in this mode, the FIREBERD will not receive data unless it is in Remote mode. The character based Remote mode ignores the REN line and always receives remote control data. Remote mode is entered whenever a valid remote control command is received error free (except Local) and the only way to then return to Local mode is to send the FIREBERD the Local command or power it down and up again.

The procedure for sending commands to the FIREBERD is as follows:

1. The controller addresses the FIREBERD to listen and sends the command characters one at a time to the FIREBERD. The FIREBERD will normally accept a character at least every four milliseconds.

2. The controller then sends a terminator sequence to the FIREBERD. This indicates to the FIREBERD that it has a valid command to process. The FIREBERD then stops receiving any more IEEE-488 data until the command has been processed.

3. If there are any errors related to the command, the FIREBERD will indicate so by generating a service request with the appropriate error status bits set. The status byte bit assignments are listed in Table 5-2. Note that the FIREBERD will not output any more data until the error service request is acknowledged by a serial poll. Also, the controller should issue the serial poll before sending any new commands.

5.4 PRINTER OPERATION

The FIREBERD supports either RS-232 or IEEE-488 printer operation as selected by the remote control PRINT command. The following sections describe the FIREBERD printer operation.

5.4.1 RS-232 Printer Outputs

The RS-232 printer operation is almost identical to that offered on the non-remote control FIREBERD. The printout consists of lines less than twenty characters each followed by a terminator. Before each character is transmitted from the FIREBERD, the DTR control line must be in the ON condition, thus providing a means for the receiving device to regulate the rate of FIREBERD outputs. At the end of each line, the FIREBERD will append the desired output terminator (as selected by the RS-232 rear panel DIP switch or optionally overridden by the TERM 232 command). After sending the desired terminator, if the FIREBERD is in SLOW print mode (as set by the SLOW remote control command), then the DTR line will not be checked and no outputs will occur for 800 milliseconds. This allows devices which do not lower their DTR control line quickly enough to inhibit normal FIREBERD outputs a chance to stop the FIREBERD. This 800 millisecond delay

Table 5-2

IEEE-488 Status Byte

Bit 0 (LSB): Set to 1 for syntax error

Bit 1: Set to 1 for input buffer overflow

Bit 2: Not used

Bit 3: Not used

Bit 4: Not used

Bit 5: Not used

Bit 6: Set to 1 for service request

Bit 7: Set to 1 for data available

may be reduced to 50 milliseconds by sending the FAST command or bypassed entirely by sending the FIREBERD the SUPER FAST remote control command. Following the final FIFO output, the FIREBERD will send an additional null (00H) character to indicate to the receiving device that the transmission is completed.

5.4.2 IEEE-488 Printer Outputs

TALK ONLY MODE

Talk Only mode printer operation is identical to that provided by the older and now obsolete IEEE-488 Addressable Talker Only interface (Option 001). No remote control capability is supported for the IEEE-488 Interface in this mode.

The Talk Only mode is selected by placing the right-most switch on the rear panel IEEE-488 DIP switch in the TALKER ONLY position (UP) and cycling the power. In this position, the five address switches on the DIP switch are not applicable. The printer or other device to be connected to the FIREBERD 488 connector should be set for continuous listening. The FIREBERD acting as a Talker may then be connected to the Listener with a standard IEEE-488 type cable. The interface is ready to operate provided that 1) the IEEE-488 Interface has been selected as the printer port by a RS-232 controller or 2) if no RS-232 controller is present that no device is holding the RS-232 DTR line in the ON condition.

Once the FIREBERD has decided to initiate a data output, the data will be transferred from the FIREBERD to the listening device. A standard 488 three-wire handshake between the FIREBERD and Listener will assure valid data transfer and determine the transfer rate.

The printer output will consist of less than 20 bytes (ASCII characters) followed by an ASCII carriage return.

ADDRESSABLE MODE

Addressable mode printer operation is almost identical to that offered by the older option 001 Addressable Talker Only interface. Printouts consist of lines of less than twenty characters each followed by a terminator. When the FIREBERD has data to transmit, it will generate a service request (provided that the service request on data option has been enabled by the SRQ ALL remote control command). Independent of the service request option, when the FIREBERD receives a serial poll status request, it will return a status byte with the most significant bit (bit 7) set to indicate that it has data to transmit. The controller should then address the FIREBERD to talk and receive the printer data. Following the final FIFO output, the FIREBERD will send an additional null character (00H) with the EOI line true to indicate to the receiving device that the transmission is completed.

5.4.3 Printer Control

The remote control option enables the user to select which printer port the FIREBERD is to direct printout data to. The user may also instruct the FIREBERD to delay all printouts until a later time or discard them completely. Due to the extreme cases which may result from these operations and the potential to cause a hang-up at the receiving device, these capabilities and their possible consequences are described in detail in the following sub-sections.

PRINTER SWITCHING

The remote controller is provided with the ability to select which port to designate as the active printer through the use of the PRINT command. While this command is transparent to all printer activity when it is used with no printouts occurring, care should be used when sending it with printouts in process. In this case, precautions must be taken to ensure that the receiving devices respond acceptably. Whenever the printer device is changed, printout will immediately be re-routed to the newly selected port. This means that the device previously receiving the printer data will now be left (most likely) waiting for the completion of the

line that it was receiving. If this is not acceptable, then either the receiving device must have the ability to time-out when it doesn't receive any more data or else the controller must guarantee that no printouts are occurring when it re-routes printer data (for example, through the EVE OFF remote control command).

PRINTER HOLD/RELEASE

A printer hold is used to delay the outputting of data from the FIREBERD till a later time. This will not result in any printer data being lost, except in the case of a print FIFO overflow,* in which case the BUFFER FULL error message will be loaded into the print FIFO at the point of overflow. A hold may be initiated in one of two ways. First, by sending the HOLD remote control command to the FIREBERD from which time the hold will be in effect until the reception of a REL (release) remote control command or the FIREBERD is returned to Local mode.

The second method for initiating a hold is only used by an RS-232 remote controller which initiates a temporary hold every time it begins sending a remote control command to the FIREBERD. This hold is then in effect until the remote control command has been completely received, decoded and any responses generated by it (such as echoes, error messages, and prompts) have been sent out.

A print hold will be initiated immediately for data being printed to the IEEE-488 Interface or after the current line has been completely output for data being printed to the RS-232 Interface. The controller should realize that a print hold causes the IEEE-488 data available serial poll status bit (bit 7) to be reset indicating that there is no longer data to transmit from the FIREBERD. Once the hold is released, the data available status bit will again reflect the true state of the FIREBERD. Also, since the print hold may interrupt the printout to the IEEE-488 at any time, the receiving device must be able to deal with the reception of an unterminated line for the duration of the hold (in case the hold interrupts a line already in process).

---

*The printer FIFO is capable of holding up to 640 bytes of data which corresponds to approximately 16 complete Results printouts.

CLEARING THE PRINT FIFO

The remote controller is provided with two methods for clearing the print FIFO, first by moving the EVENT switch from a position other than OFF to the OFF position, and second by sending the CLEAR FIFO remote control command. Since printouts are terminated immediately following either of these actions, it is recommended that the controller use these functions with caution as they may lead to problems when interpreting the received data.

5.4.4 Remote Control Printouts

There are several FIREBERD printouts which are unique to the remote control option. These printouts are listed in Tables 5-3 and 5-4 along with a short description of each. Printouts which are not unique to remote control operation are shown in the main FIREBERD manual. Note that only the generalized form of the HELP printout (which lists all of the command and switch names recognized by the FIREBERD) is given. The more specific forms of the HELP command (which list all of the possible parameters for a specific switch) were not listed due to the number and length of these printouts. It is suggested that the user become familiar with this command and its usage since it provides a convenient syntax guide for remote control and eliminates the need to constantly reference this manual.

Table 5-3
Remote Control Printouts

STATUS PRINTOUT

FORMAT
SLOW
TERM 232 CRLF
TERM 488 CR
PROMPT OFF
ECHO OFF
SRQ ALL
REN CHR
PRINT AUTO
DISPLAY LOCAL
AUDIO ENABLE
ISU LOCAL
FREQ INT 1 SEC
SYNC LOSS NORMAL

TIME PRINTOUT

15:28:34

DATE PRINTOUT

JAN 23

NON-VOLITILE MEMORY FAILURE PRINTOUT

NOVRAM FAILURE

LAST POWER DOWN TIME

19:16:07 127 JAN08
LAST POWER DOWN

Table 5-4
General Help Printout

AUDIO
AUT SYN
BEEP
BER TES LEN
BLK LEN
CLEAR
CLEAR FIFO
CONT
CONTROLS
DATE
DIS
DISABLE
DISPLAY
DM
DSR
DTR
ECHO
ENABLE
ERR INS
ERROR
EVE
FAST
FORMAT
FREQ INT
GEN CLO
HELLO
HELP
HOLD
ISU
LOCAL
LOO TES
MOD
PAT
PRI CON
PRI EVE
PRINT
PROMPT
RECALL
REL
REMOTE
REN
RES
RES HOL
RESULTS
RLS
RR
RS
RTS
RUN
SLOW
SRQ
STATUS
STOP
STORE
SUPER FAST
SYNC LOSS
TERM 232
TERM 488
TERMINAL
TEXT
TIME
TR
UNFORMAT
UP DAT
UPD

APPENDIX A
REMOTE CONTROL SAMPLE PROGRAM

This appendix provides a computer program written for use on a Hewlett Packard 85 computer which has the 82939A Serial Interface, 82937A HP-IB Interface and I/O ROM options installed. When the program is run, it sequentially asks the user a series of questions which determine the operating configuration. First, it asks whether results are to be printed on it's internal printer or displayed on the CRT. Second, it lets the user choose RS-232 or IEEE-488 operation, and if IEEE-488 operation is selected, Addressable or Talk Only mode.

For IEEE-488 Addressable mode operation, the FIREBERD(S) and other devices should be connected together in the standard fashion. Each FIREBERD should be set for Addressable mode and have a unique address set on it's rear panel IEEE-488 DIP switch before power is applied. Each other device should be set appropriately. After all devices are powered up, the program may be run. After the user selects IEEE-488 Addressable mode, the computer will sequentially perform a serial poll to all allowable addresses. The user is provided with a list of all responding addresses. The user is then given the opportunity to modify the list, which after modification, will be the only addresses polled upon the receipt of a Service Request.* At this point the program stops and waits for Service Requests (SRQ's). If a FIREBERD has data to output, it will generate a SRQ. The controller will then poll devices on the bus and examine the Serial Poll Status Byte provided by each device. When the computer finds the device which initiated the SRQ, it examines the status byte and prints or displays the device address and appropriate Fault message if the error bits are set in the status byte. If the Data Available bit is set, the FIREBERD is addressed to talk and the data is displayed or printed along with the device address. The user may send commands to any device on the bus by depressing the "K1" key which will cause the computer to ask for the command and device address.

---

*This program is designed to process FIREBERD's particular serial poll status byte. If devices other than FIREBERDS are connected to the bus, and these devices initiate service requests, the program should be modified to appropriately process the device SRQ or the device address should be excluded from the list of devices to be polled upon receipt of SRQs.

```
10 DIM I$[32],O$[32]
20 DIM U(20)
30 ENABLE KBD 255-16
40 Z$=CHR$(13)&CHR$(10)&CHR$(10
   )&CHR$(1)
50 CONVERT IN 7 PAIRS ; Z$
60 CONVERT IN 10 PAIRS ; Z$
70 CLEAR
80 DISP "SEND RECEIVED DATA TO
   PRINTER"
90 DISP "(Y/N) ";
100 INPUT A$
110 IF A$="Y" THEN PRINTER IS 2
   @ GOTO 140
120 IF A$<>"N" THEN 70
130 PRINTER IS 1
140 CLEAR
150 DISP "CONTROL THRU IEEE-488
   OR RS-232"
160 DISP "(I/R) ";
170 INPUT A$
180 IF A$="R" THEN 1310
190 IF A$<>"I" THEN 140
200 REM
210 REM IEEE-488
220 REM
230 CLEAR
240 ABORTIO 7
250 DISP "ENTER FIREBERD TYPE:"
260 DISP
270 DISP "      ADDRESSABLE"
280 DISP "          OR"
290 DISP "      TALK ONLY"
300 DISP
310 DISP "(A/T) ";
320 INPUT A$
330 IF A$="A" THEN 430
340 IF A$<>"T" THEN 230
350 REM
360 REM IEEE-488 TALK ONLY
370 REM
380 CLEAR
390 SEND 7 ; MLA
400 ENTER 7 USING "%,%K" ; I$
410 GOSUB 1570
420 GOTO 390
430 REM
440 REM IEEE-488 ADDRESSABLE
450 REM
460 A9=0
470 SET TIMEOUT 7;10
480 ON TIMEOUT 7 GOTO 530
490 FOR I=0 TO 20
500 U(I)=0
510 S=SPOLL(700+I)
520 U(I)=1
530 ABORTIO 7
540 NEXT I
550 CLEAR
560 DISP "UNITS TO BE POLLED:"
570 DISP
580 FOR I=0 TO 20
590 IF U(I)=1 THEN DISP I;
600 NEXT I
610 DISP
620 DISP
630 DISP "DO YOU WISH TO ALTER T
   HIS LIST"
640 DISP "(Y/N) ";
650 INPUT A$
660 IF A$="N" THEN 740
670 IF A$<>"Y" THEN 550
680 CLEAR
690 DISP "ENTER FIREBERDS ADDRES
   S";
700 INPUT A
710 IF A<0 OR A>20 THEN 690
720 U(A)=1-U(A)
730 GOTO 550
740 CLEAR
750 W=0
760 REM
770 REM POLL FIREBERDS
780 REM
790 ON KEY# 1 GOSUB 1080
800 FOR I=0 TO 20
810 IF U(I)=0 THEN 1030
820 SET TIMEOUT 7;1000
830 ON TIMEOUT 7 GOTO 1040
840 ABORTIO 7
850 S=SPOLL(700+I)
860 IF BINAND(S,64)<>0 THEN BEEP
    100,20
870 IF BINAND(S,3)=0 THEN 940
880 REM
890 REM IEEE-488 REMOTE ERROR
900 REM
910 DISP "FAULT ";
920 IF BINAND(S,1)=1 THEN DISP "
   SYN" @ GOTO 940
930 DISP "OVF"
940 IF BINAND(S,128)=0 THEN 1030
950 ENTER 700+I USING "%,%K" ; I
   $
960 IF W=1 THEN 1010
970 PRINT
980 PRINT "***** UNIT ";I;"*****
   "
990 PRINT "--------------------
   ----------"
1000 W=1
1010 GOSUB 1570
1020 IF I$=CHR$(0) THEN W=0 @ DI
   SP @ BEEP 40,20 @ GOTO 1030
1030 IF W=1 THEN 820
1040 W=0
1050 ABORTIO 7
1060 NEXT I
1070 GOTO 770
1080 REM
```

```
1090 REM SEND IEEE-488 COMMAND
1100 REM
1110 REM
1120 DISP "ENTER COMMAND [;ADDRE
     SS]";
1130 INPUT O$
1140 IF O$="CLEAR 7" THEN CLEAR
     7 @ GOTO 1290
1150 IF O$="CLEAR 700" THEN CLEA
     R 700 @ GOTO 1290
1160 IF LEN(O$)=0 THEN 1260
1170 P1=POS(O$,";")
1180 IF P1=0 THEN A=A9 @ GOTO 12
     40
1190 IF P1+1>LEN(O$) THEN 1110
1200 IF P1=1 THEN 1110
1210 A=VAL(O$[P1+1]) @ O$=O$[1,P
     1-1]
1220 IF A<0 OR A>20 THEN 1110
1230 A9=A
1240 ON TIMEOUT 7 GOTO 1270
1250 OUTPUT 700+A USING "K" ; O$
1260 GOTO 1290
1270 DISP
1280 DISP "*** UNIT NOT RESPONDI
     NG ***"
1290 ON TIMEOUT 7 GOTO 1040
1300 RETURN
1310 REM
1320 REM RS-232 CONTROLLER
1330 REM
1340 CLEAR
1350 ABORTIO 10
1360 CONTROL 10,3 ; 11
1370 CONTROL 10,4 ; 30
1380 CONTROL 10,2 ; 1
1390 CONTROL 10,11 ; 2
1400 ON KEY# 1 GOSUB 1490
1410 SET TIMEOUT 10;2000
1420 ON TIMEOUT 10 GOTO 1400
1430 STATUS 10,10 ; S
1440 IF BINAND(S,1)=0 THEN 1400
1450 ENTER 10 USING "%,#K" ; I$
1460 GOSUB 1570
1470 GOTO 1400
1480 REM
1490 REM SEND RS-232 COMMAND
1500 REM
1510 OUTPUT 10 USING "#,K" ; " "
1520 CLEAR
1530 DISP "ENTER REMOTE COMMAND"

1540 INPUT O$
1550 OUTPUT 10 USING "K" ; O$
1560 RETURN
1570 IF I$="" THEN 1610
1580 IF I$[1,1]<>CHR$(1) THEN 16
     10
1590 BEEP 8,20
1600 I$=I$[2,LEN(I$)]
1610 IF I$=CHR$(0) THEN 1630
1620 PRINT "    - ";I$
1630 RETURN
```

If IEEE-488 Talk Only mode is selected, the FIREBERD rear panel DIP switch must be set to Talk Only and only one FIREBERD should be connected to the computer. No remote control is provided in this mode and the computer simply prints or displays results provided to it by the FIREBERD.

If RS-232 operation is selected, the FIREBERD baud rate and data format selected by the rear panel RS-232 DATA format switch must be matched to the format provided by the computer (also strappable). The computer can be connected to the FIREBERD via the Remote Adaptor described in Section 2. Once the program is run and RS-232 control is selected, the computer will display or print data received from the FIREBERD and will allow the user to send commands by depressing the "K1" key and entering the command.

Note that HP computers typically terminate their inputs upon the reception of a linefeed character. The FIREBERD 2000 with software Revision B now supports this scheme directly. By setting the "TERM 488 LF" command, there is no longer a need for the convert statement of lines 40, 50, and 60. This greatly simplifies the interfacing requirements. Also the factory setting for the 488 terminator is now set to "CR LF".

The following programs provide a very simple means of inputting and outputting FIREBERD data by way of an Hewlett Packard computer.

The first program is an input routine which will continually poll the FIREBERD at address zero (0). When data is available the computer will display it.

The second program is an output routine. This routine can be used to send commands to the FIREBERD.

The last program incorporates both features. The computer acts as a printer from the time you run the program. Then to send any command you depress softkey #1 (k1), type your command, and then enter it (ENDLINE on the HP-85).

NOTE: When the FIREBERD sees a valid command it enters Remote mode, therefore, disabling FIREBERD front panel switches. The following programs send the local command after each command sent to simplify this demonstration program by allowing front panel access.

Program #1

```
10 CLEAR
20 DIM I$[20]
30 DISP "WAITING FOR FIREBERD PRINTS"
40 OUTPUT 700 ;"/"
50 S=SPOLL(700)
60 IF BINAND(S,128)#0 THEN ENTER 700 USING "%,%K" ;
   I$@ DISP I$
70 GOTO 50
```

Program #2

```
10 CLEAR
20 DISP "ENTER COMMAND"
30 INPUT 0$
40 OUTPUT 700 ;0$
50 OUTPUT 700 ;"/"
60 GOTO 10
```

Program #3

```
10 CLEAR
20 DISP "DEPRESS k1 TO SEND COMMAND"
30 DISP "------------------------------"
40 DISP "WAITING FOR FIREBERD PRINTS"
50 DIM I$[20],0$[30]
60 ON KEY# 1 GOSUB 110
70 S=SPOLL(700)
80 IF BINAND(S,1)#0 THEN DISP "SYNTAX ERROR" @ DISP
90 IF BINAND(S,128)#0 THEN ENTER 700 USING "%,%K" ;
   I$@ DISP I$
100 GOTO 70
110 DISP "ENTER COMMAND"
120 INPUT 0$
130 IF LEN(0$)#0 THEN GOSUB 150
140 RETURN
150 OUTPUT 700 ;0$
160 OUTPUT 700 ;"/"
170 RETURN
```

APPENDIX B
REV. A SOFTWARE DIFFERENCES

To determine the revision level of your FIREBERD's software, set the PRINT EVENT switch to the 30-minute position and (with the FIREBERD connected to either a printer or terminal) cycle the power (ON-OFF-ON). The message printed will indicate the revision level as follows:

"PWR ON" = Rev. A
"POWER ON"= Rev. B

Note that the Rev. B printout will also include the power-up time and (if the remote control option is installed) the time of the last power-down.

The Rev. A software differences (from the Rev. B description in this manual) are as follows:

- Minor differences in some printout formats.

- Rev. A does not include the current time or time of last power-down in its power on printout.

- Rev. A does not label its RESULTS printouts as to the reason for their occurrence (i.e., "10-minute print").

- Rev. A does not support the "LF" or "NONE" options for the 232 or 488 terminator commands (TERM 232 and TERM 488, respectively).

- Rev. A does not support the ENABLE or DISABLE functions. The print on signaling change option can be enabled or disabled using the "SIG ON" or "SIG OFF" instructions, respectively. The current state of this function (i.e., ON or OFF) can be retained by the "SIG" command.

- Rev. A does not support the "ERROR" command.

- Rev. A only accepts the "EVE" command to set the print event switch (as opposed to Rev. B which accepts either "EVE" or "PRI EVE") and only 1, 10, and 30-minute intervals are allowed (as opposed to any interval between 1 and 9999 minutes for Rev. B).

- Rev. A does not support the "SUPER FAST" print mode.

- Rev. A supports 10 sets of remote control stored switch sets (numbered "0" through "9") as opposed to 5 for Rev. B (numbered "0" through "4).

- Rev. A requires the time to be set in the format "TIME HH:MM:SS" and automatically sets the seconds to 00. Rev. B does not input seconds and uses the format "TIME HH:MM." Rev. B does not require leading zeros for either the time or date.

- Rev. A does not terminate the ongoing printout immediately after the print buffer is cleared. Erroneous data may be output following the FIFO clear until the printout completes. Rev. B fixes this.

- Rev. A displays the date in numeric form (i.e., "01/23" instead of "JAN 23").

- Rev. A does not support the percent error (or violation) free seconds or SYNC LOSS result.

- Rev. A is limited in its printouts of various interface settings and results print nomenclature.

- Rev. A does not perform a full RAM and ROM check or power-up.

- The Rev. A FIREBERD will automatically inhibit all printouts after the internal error counters overflow 10 times. This can only be deactivated by restarting the test. Rev. B does not do this.

- Rev. A has a 512-byte printer FIFO as opposed to the 640-byte Rev. B FIFO.

- Rev. A does not have the "SYNC LOSS OPTION" command and always operates in "SYNC LOSS NORMAL" mode.

- Rev. A does not have any variable frequency test intervals and does not generate end of frequency cycle prints when the event switch is in the BER CYCLE position. Rev. A operates in "FREQ INT 1 SEC" mode.

- Rev. A does not support individual results prints via the "PRI" command.

- Rev. A does not accept the "FRE TES LEN" or "FRE CYC" command entries as options for the "BER TES LEN" and "BER CYC" switch and position, respectively.

- Rev. B prints 2400 baud RS-232 data approximately 70% faster than Rev. A.

- Rev. A does not have the Interval Analysis feature (RUN/STOP/CONT).

Telecommunications Techniques Corporation
20410 Observation Drive Germantown, Maryland 20876 USA
(800) 638-2049 • (301) 353-1550 • Fax: (301) 353-0731